

The OSSE Framework at the NASA Global Modeling and Assimilation Office (GMAO)



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Summary

The Global Modeling and Assimilation Office (GMAO) has been developing an Observing System Simulation Experiment (OSSE) framework. The OSSE system is currently based on the Nature Run (NR) developed by GMAO called G5NR. The G5NR is currently being tested for use in the GMAO OSSE

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OSSE Experiments

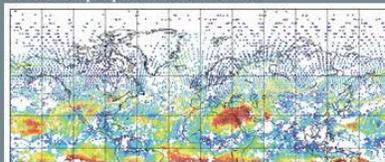
Some recent improvements to the GMAO OSSE framework include the easier user control of options via resource files, removal of some bugs, the optional output of additional diagnostics, and simplification of scripts. The new codes avoid rereading of the G5NR data sets when generating synthetic observations and use ESMF Shared Memory to accommodate large datasets. The selection of observation error correlation functions has also been generalized.

Real Obs
BufFr.Txt

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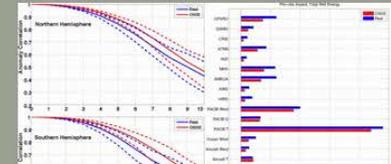
GMAO OSSE Components

- **The GEOS-5 Nature Run (G5NR):** A 2-year global, non-hydrostatic mesoscale simulation with a 7 km horizontal resolution.
- **A Package to Simulate Observations:** G5NR is interpolated to the location of real observations then satellite radiances and GPS bending angles are simulated
- **Error Addition/Tuning:** Realistic errors are added to the synthetic observations based on O - F differences
- **GEOS-5/GSI DA System:** Currently GSI as data assimilation system and GEOS-5 as the NWP model
- **CRTM Coefficient Training:** New capability to be able to simulate satellite radiances for future instruments
- **Generation of Real-ish Observations:** Hyperspectral obs are used to generate semi-real IR obs for proposed instruments

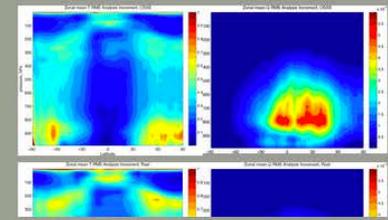


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Evaluation of the OSSE System



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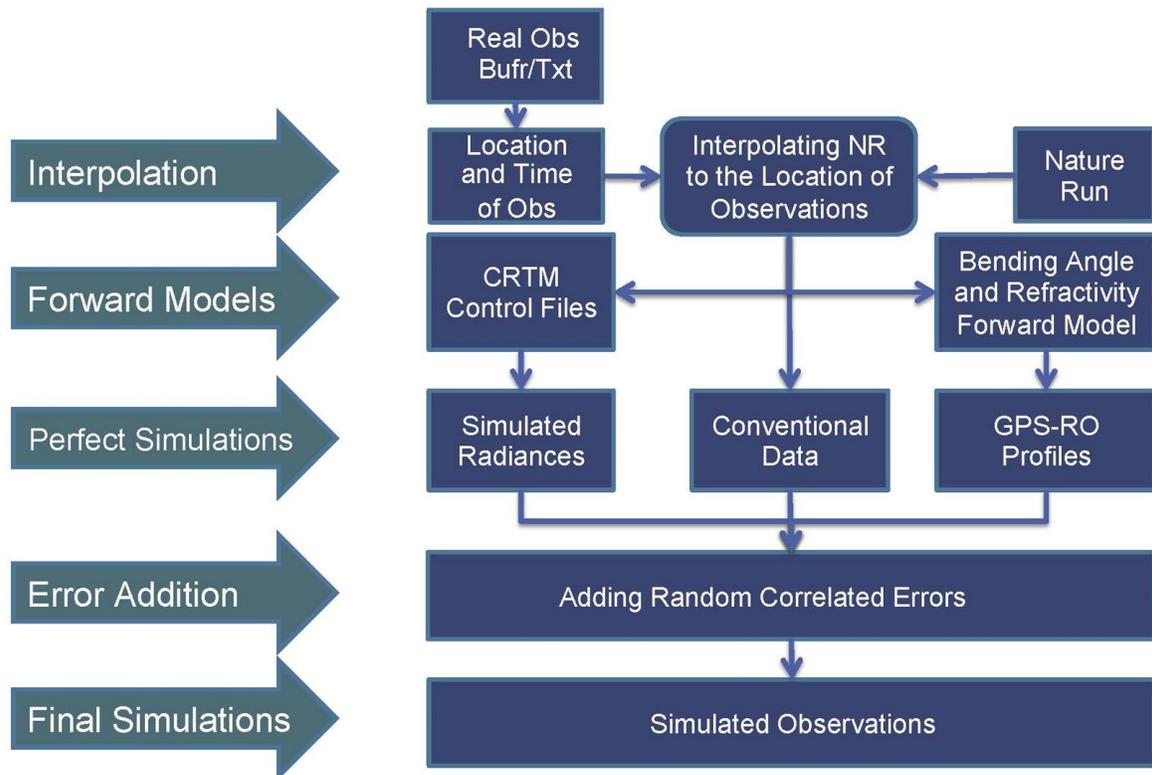


SUMMARY

The Global Modeling and Assimilation Office (GMAO) has been developing an Observing System Simulation Experiment (OSSE) framework. The OSSE system is currently based on the Nature Run (NR) developed by GMAO called G5NR. The G5NR is currently being tested for use in the GMAO OSSE framework. Synthetic observations have been generated based on the G5NR fields, including conventional observations, GPS, and satellite radiances. These synthetic observations are ingested using the Gridpoint Statistical Interpolation data assimilation system, with forecasts performed by the GEOS-5 model at 55 km/72L.

OSSE EXPERIMENTS

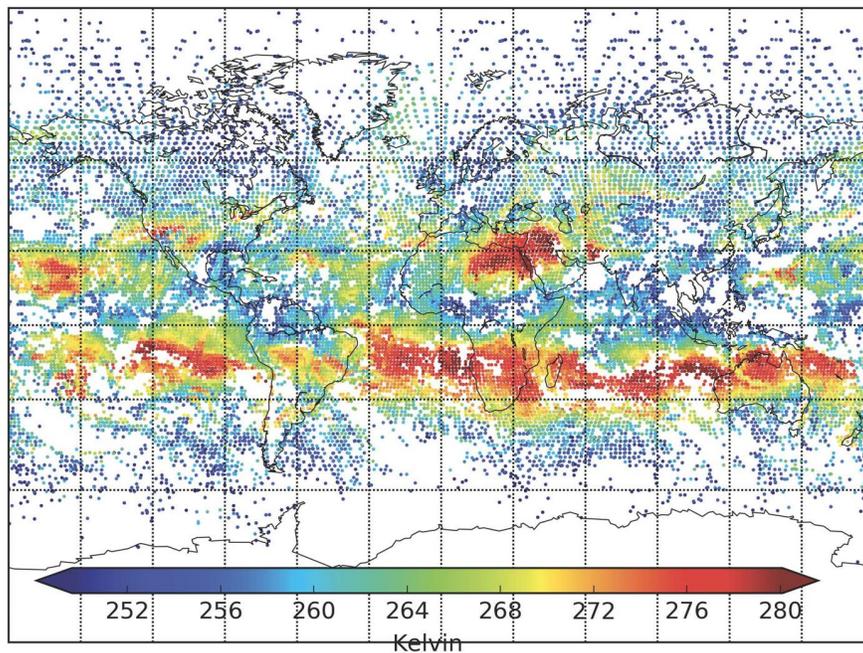
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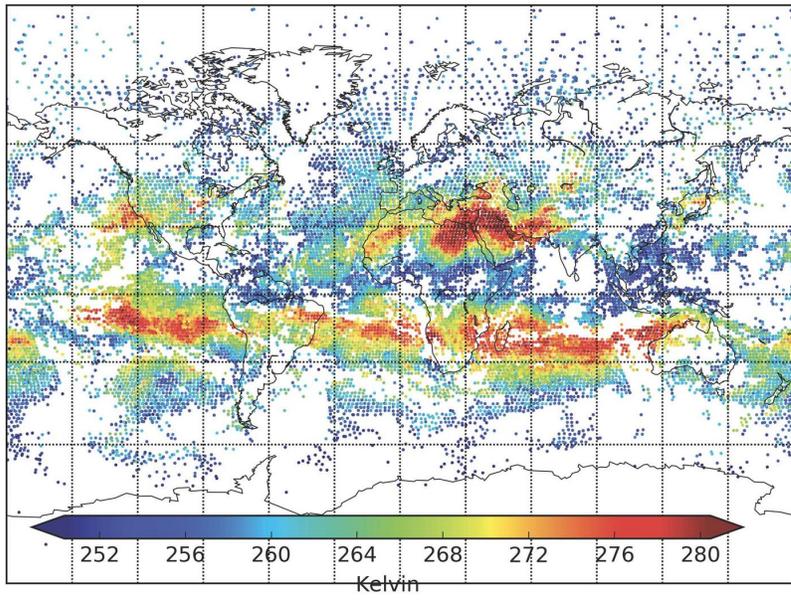


Schematic Description of Simulating Synthetic Observations by the GMAO OSSE Package.

GMAO OSSE COMPONENTS

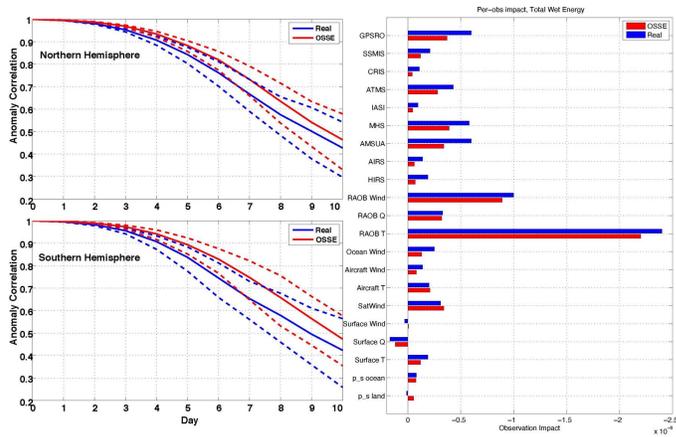
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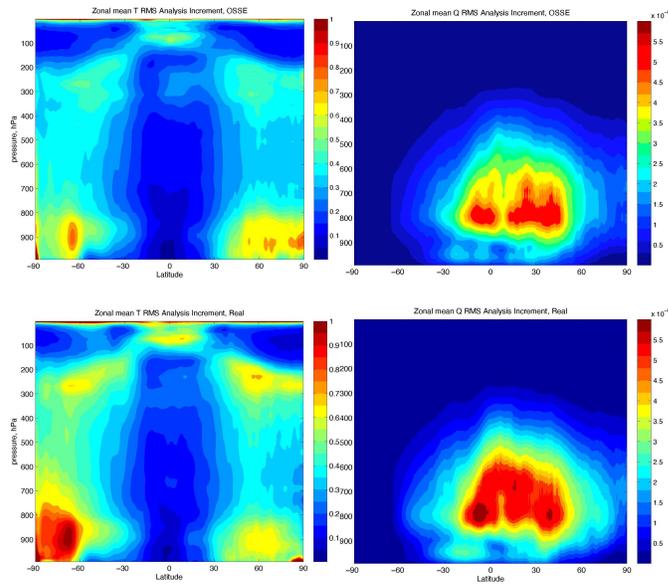


Real (top) versus simulated (bottom) observations for an infrared instrument.

EVALUATION OF THE OSSE SYSTEM



Anomaly correlation (left) and observation impact per obs (right) for both OSSE and Real systems.



Observation increments (analysis minus background) for temperature (left) and specific humidity (right) for the OSSE (top) and real (bottom) observations.

This work was supported by the NASA Global Modelling and Assimilation Office (GMAO). Computing resources are made available by the NASA NCCS. For more information visit the GMAO website: <https://gmao.gsfc.nasa.gov/>

ABSTRACT

This abstract summarizes the OSSE framework developed at the Global Modeling and Assimilation Office at the National Aeronautics and Space Administration (NASA/GMAO). Some of the OSSE techniques developed at GMAO including simulation of realistic observations, e.g., adding errors to simulated observations, are now widely used by the community to evaluate the impact of new observations on the weather forecasts. This talk presents some of the recent progresses and challenges in simulating realistic observations, radiative transfer modeling support for the GMAO OSSE activities, assimilation of OSSE observations into data assimilation systems, and evaluating the impact of simulated observations on the forecast skills.